BELLCOMM, INC.
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SUBJECT: MLS Comments to the S-056 Experiment Delta Critical Design Review - Case 620

DATE: February 19, 1969

FROM: S. H. Levine

MEMORANDUM FOR FILE

The Goddard Space Flight Center (GSFC) ATM experiment S-056 delta Critical Design Review (CDR) was held at MSFC on January 30, 1969.

This design review was intended to cover elements of the ATM S-056 X-Ray Telescope experiment that were not adequately covered at the formal S-056 experiment CDR on January 31 and February 1, 1968. Among the items which were discussed during this delta CDR were:

a. the X-Ray Event Analyzer (X-REA) Electronic Subsystem,

b. the Camera Electronics Subsystem,

c. the S-056 Electrical Checkout Equipment (ECE), and

d. the S-056 experiment test, quality and reliability program.

Attachment I presents comments by the author on the S-056 delta CDR.

S. H. Levine

1024-SHL-li

Attachment

ATTACHMENT I

MLS COMMENTS AND OBSERVATIONS ON THE ATM
S-056 EXPERIMENT DELTA CDR

General Deficiencies

1. The CDR of the S-056 Activity History Recorder has been deferred until the ATM CDR which will be held in the fall of 1969. National Cash Register Corporation (NCR), the selected manufacturer for the Activity History Recorder has had an employee strike which has retarded development of this equipment over the past six weeks. Because of the relative importance of the Activity History Recorder to S-056 data acquisition, an earlier evaluation of this equipment would be desirable to minimize changes downstream that could affect the experiment and the ATM Control and Display Console.

2. Due to a shutdown in production lines of Westinghouse flat-packs that were selected for S-056 micrologic application, a switch-over to another source (Texas Instruments) was required. MSFC assured the review team that performance of the new integrated circuits exceeds that of the old flat-packs, and only minor configuration differences (e.g. quantity of pins) exists between the modules. All development test data presented at this review were based on the Westinghouse flat-packs. MSFC requested that the requirement for testing should be waived on the basis of the apparent compatibility and the known performance of the new units. It is difficult to accept this philosophy without some representative bread-board testing to confirm the performance of the new components in their particular application.

Materials Control

Mr. Millikan, the GSFC principal investigator, questioned the use of mu-metal for X-REA electromagnetic shielding application on ATM. Apparently the permeability characteristics of this material deteriorates when subjected to shock loads. In view of the fact that the shock environment of the LM/ATM may be higher than previously estimated,(1) it is felt that further investigation is required to determine the suitability of this material on ATM.

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(1) Trip Report - ATM Film Camera Working Group Meeting - Case 620, Memorandum for File, February 10, 1969 by S. H. Levine

Reliability

1. It was agreed by all participants that the S-056 Failure Modes and Effects Analysis (FMEA) and the Single Point Failure (SPF) Summary were inadequate to provide a basis for evaluating the reliability of the S-056 system. Further effort is required to provide an up-to-date complete FMEA and SPF on the system.

2. The S-056 camera airlock door is located on the telescope side of the telescope/film magazine interface. This airlock seals the magazine aperture during the pre-launch phase and is opened permanently after lift-off. Failure of this door will prevent any operation of the X-ray Telescope and film data acquisition by S-056. This door is a single point failure in the system. Adequate electromechanical redundancy should be provided to reduce the probability of this failure.

3. The ATM Telemetry System provides a four pps sync pulse train to the X-REA section of the S-056 experiment. This signal is used to drive counters in the experiment Digital Signal Conditioner which are in turn used for experiment telemetry and experiment proportional counter aperture control. This interface is not redundant. Should failure of the sync source occur, the effect would be profound. It is suggested that the sync pulse input to this experiment be made redundant.

4. Reexamination of the S-056 camera electronics logic is required to:

a. assure that loss of any single monitor signal (e.g. reed switch film advance indication, reed switch camera airlock opened indication, magazine in place indication, etc.) does not inhibit operation of the X-ray telescope, and

b. that the experiment can be operated (i.e., tested) without a film magazine in place.

Ground Support Equipment

The rationale was questioned for sending experiment checkout equipment (bench-type checkout equipment) to KSC in support of the S-056 experiment, when capability for realignment of experiments on the ATM experiment package spar does not exist at KSC. This objection appears valid.

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